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ABSTRACT

Precision teaching (PT) is an approach to the science of human behavior that focuses on precise monitoring of carefully defined behaviors in an attempt to construct an environmental analysis of that behavior and its controlling variables. A variety of subjects have been used with PT, ranging in academic objectives from beginning reading to college psychology courses in theories of personality. The major tenets of PT are an emphasis on precise definitions of behavior, the use of response rate as a dependent measure, continuous charting of student performance on standard celeration charts, and focus on fluency of correct responses rather than accuracy alone. Four components of a PT program have been identified: (1) a system for recording and charting data; (2) the requirement of a precise definition or "pinpointing" of the behavior under study; (3) the IS-DOES formula--an environmental-behavior analysis that examines all the possible environmental events that might affect a behavior under study; and (4) the Behavior Bank--a technology for facilitating dissemination of information about PT. Currently, those who subscribe to the Precision Teaching philosophy are a small group who are very active in the branch of psychology called behavior analysis. Precision Teaching researchers disseminate their work through the Journal of Precision Teaching, and announcements for their annual conferences can be found therein. A list of references is provided. (JB)

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Precision Teaching

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In science, the need for measurement of a subject matter is apparent. As Johnston and Pennypacker (1980, p. 55) have stated, "Measurement is the cornerstone of all scientific activities." And, as S. S. Stevens has written, "We know about psychological phenomenon only through effects, and the measuring of the effects themselves is a first trudge, on the road to understanding" (cited in C. M. Starlin, 1971, p. 102). In fact, the issue of measurement constituted the point of fracture between 18th and 19th century philosophers and early experimental psychologists (cf. Boring, 1950, particularly chapter 14).

To be sure, methods of quantification have changed greatly since Weber's Just Noticable Difference (e.g., Nevin, 1984). Behavior can be measured in numerous ways. The Journal of Applied Behavior Analysis, for example, illustrates a variety of measures in the articles published therein (e.g., Klein, 1975). Behaviors have been reported in terms of their frequency alone, per day, per hour, and per minute. Also, the percent of time a behavior occurred, or an average percent of time a behavior occurred during a given observation period, is commonly used. And, more often than not, data are presented on arithmetic graphs built to fit the data presented (e.g., Miller, 1980). What seems to be lacking is

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a direct, precise, and standard method of recording behavior.

This is what Precision Teaching is all about. Developed and disseminated predominantly by Dr. Ogden Lindsley at the University of Kansas, Precision Teaching is more a language and measurement system than a method of teaching (cf. Alper & White, 1971; Duncan & Lindsley, 1971). As Lindsley (Duncan & Lindsley, 1971) has stated:

Precision teaching is not an approach; it is an easy, inexpensive system of monitoring daily improvement--not performance, but improvement. Improvement is acceleration; performance is frequency of occurrence.
(p. 119)

PT has been researched and implemented mainly in primary grades and special education classes (e.g., Duncan, 1974; Haughton, 1971a; Perry, 1974), although university applications of the technology are documented (e.g., Bower & Orgel, 1980; Merbitz & Olander, 1980). A variety of subjects have been used with PT ranging from academic objectives such as beginning reading (e.g., Johnson, 1971) to college psychology theories of personality courses (McDade, Rubenstein, & Olander, 1983). Personal behavior management problems have also been addressed (e.g., Cohen & Martin, 1971; Haughton, 1971a). PT has been used by administrators (Haughton, 1971b), parents (Lindsley, 1970), grade school teachers (e.g., Bersoff & Ericson, 1972; Hirsch, 1971), special education teachers (e.g., Johnson, 1971), college teachers (e.g., Merbits & Olander, 1980), graduate students

(Korinek & Wolking, 1984), grade school children in groups (A. Starlin, 1971) and individually (Bates & Bates, 1971; A. Starlin, 1971), and with gifted children (Duncan, 1971).

The major tenets of PT are an emphasis on precise definitions of behavior, the use of response rate as a dependent measure, continuous charting of student performance on Standard celeration charts, and focus on fluency of correct responses rather than accuracy alone (e.g., Alper & White, 1971; Bersoff & Ericson, 1972; Duncan & Lindsley, 1971; Lindsley, 1971a). In one word, the most significant contribution PT has offered education is standardization; or as Lindsley (1971a) has stated, precision.

Bradfield (1970) has listed four components of a PT program:

1. A system for recording and charting data;
2. The requirement of precise definitions of behavior;
3. The IS-DOES formula;
4. The Behavior Bank;

The first component, recording and charting on standard celeration charts, is perhaps the most fundamental to a PT program. The six cycle logarithmic chart provides precise recording of a virtually unlimited frequency of behavior. Ranges from one behavior every thousand minutes (one per day), to one thousand behaviors per minute can be recorded on the same daily chart. For behaviors at lower frequencies, weekly, monthly, and yearly charts are available. And comparisons of behavior changes are facilitated because the record is standardized. That is, all standard celeration charts represent the same fundamental measure,

response frequency over time. This measure, the number of behaviors divided by the time taken to count them, is basic to Skinner's (1938) science of behavior. As Skinner himself said, "My major contributions are rate of response and the cumulative recorder" (cited in Lindsley, 1971a, p. 2; cf. Skinner, 1938, p. 20).

Recording behavior on a standard celeration chart is easy, although the chart can appear intimidating to a novice. Here is a brief introduction to the chart. The abscissa marks successive calendar days that are numbered from 0 to 140. Every seventh line is a little darker and represents a Sunday. This facilitates ease of reading as the darker Sunday lines divide the abscissa into weeks. Running horizontally across the top of the chart are the number of weeks approximately divided into month-long intervals. Hence, the chart not only allows monitoring of daily behavior, but continual monitoring of daily behavior for up to 20 weeks.

The ordinate is labeled "count per minute" which refers to the behavior in question. The numbers ranging from .001 to 1000 up the ordinate represent the frequency per minute. Equal ratios along the ordinate are represented by equal distance; the distance from 5 to 10 is the same as the distance from 10 to 20. Both are ratios of two. This allows proportional display of data and eliminates possible distortion created by arithmetic "stretch-to-fit" graphs (C. M. Starlin, 1971). The ratio scale on the ordinate displays learning as a straight line rather than a learning curve, which appears on an add scale. The slope of the

straight lines are standard, regardless of frequency. A 33 degree slope always represents the doubling of celeration on the chart.

To chart, one needs only to find the day the behavior occurred along the abscissa and then the number along the ordinate representing the observed rate. For example, a behavior that occurs five times in one minute would be recorded on the day line at the "5" value of the ordinate scale. If this behavior decreased in rate to five times in a day, it would be recorded on the ".005" value of the ordinate because the behavior occurred five times in 1,000 minutes--the number of minutes in an average waking day. Necessary details of how to use standard celeration charts and subsequently read and interpret them can be found in the Handbook of the Standard Behavior Chart by Pennypacker, Koenig, and Lindsley (1972).

The second component of PT is the requirement of a precise definition or "pinpointing" the behavior under study. Because all data in a PT program are expressed in terms of rate, a precise definition of the behavior is needed. The behavior needs to be directly observable, and involve movement (Alper & White, 1971; Bradfield, 1970). Bradfield (1970, p. 23) has termed this "the dead man's test. If a dead man can do it, it can't be counted."

A third component of PT is, or perhaps, was, the IS-DOES formula. The IS-Does formula does not receive the emphasis it once did in PT, and is more of an historical note. Elements of PT taught to classroom teachers today are the pinpointing and charting already discussed (Personal communication, Kathy Porter,

September 24, 1985). The formula will be described here, to offer a comprehensive review of PT.

The formula attempts to include all of those environmental variables that might effect the performance of an individual (see Alper & White, 1971; Haughton, 1971a; Lindsley, 1964; C. M. Starlin, 1971). Bradfield (1970) has said of the formula:

It may well be that through the development of the IS-DOES formula Lindsley has made a major contribution to education and psychology by reemphasizing the importance not only of precise behavioral definition, but also by calling attention to the fact that there are other equally important components in behavior modification procedures in addition to reinforcement. He has taken the emphasis off 'M & M's' and placed it where it should be: on the total learning process (original emphasis). (p. 26)

The IS-DOES formula is an environment-behavior analysis that examines all the possible environmental events that might affect a behavior under study. Events that occur prior to and immediately after a behavior-- the IS analysis--are categorized under the following labels:

Program. This turns the programmed event on and off (e.g., a light turned on serving as a discriminative stimulus).

Programmed event. This is comprised of the environmental events occurring immediately prior to, or

during, the emission of the behavior under study. At this point of the analysis, whether any of these events actually control the behavior under study is not known. Examples of programmed events are instructions, demonstrations, etc.

Movement cycle. This is the label given to the behavior under study. Remember, to chart, a behavior must involve movement and must be cyclical--that is, have a discrete beginning and end and recur; hence, "movement cycle."

Arrangement. This describes the relationship between the number of times the movement occurs and the number of subsequent events that follow it. An example would be for every 10 math problems completed, a child is given one token.

Arranged event. An arranged event is similar to a programmed event but it differs in that it is arranged to follow the behavior immediately after the behavior occurs. Again, it is not known at this stage of the analysis if the arranged event is controlling the movement cycle.

These labels represent what the environment-behavior relationship IS (Lindsley, 1964). They describe events and relationships that have the potential to control behavior.

Having observed these events and relationships for about nine days (cf. Alper & White, 1971), the DOES analysis is in order.

This is an interpretation of the IS analysis after having continually observed the behavior. During this analysis the following labels may replace the labels from the IS analysis.

Disposition. Once a behavior has been shown to be under the control of environmental events formerly called the program, then those events are called dispositions.

Stimuli. Formerly called programmed events, these events have been demonstrated to exert some control over the movement cycle. They must control the response independent of the program. The program is usually systematically changed to check for this.

Response. The movement cycle observed during the IS analysis, now having been shown to be under the control of some event, is called a response. It is a response to a dispositional stimulus or a response for a consequence.

Contingencies. This is the functional description for the arrangement described in the IS analysis. Once an arrangement is responded to it is a contingency and can be used to control other behavior.

Consequence. A consequence is an arranged event that has been shown to have control over a response.

This second description refers to what DOES work in the environment-behavior interaction (Lindsley, 1964). IS-DOES was developed by Lindsley to aid with laboratory analysis of human

behavior. Classrooms are seldom controlled enough to do a fine component analysis.

These terms may seem awkward to those unfamiliar with PT. New jargon is rarely accepted easily, and criticism of behavioral terminology is not without precedent (e.g., Michael, 1975; 1980). Although terms such as disposition and arranged event may seem awkward, they were used in an attempt to increase communication and facilitate dissemination of the technology (Alper & White, 1971; Bradfield, 1970; Lindsley, 1971a; 1971b; C. H. Starlin, 1971). Bradfield (1970) has said that PT:

. . . provides a common language, a means of communication through which all those involved with the education of a given child may begin to communicate in precise and understandable terms. It requires that we become definitively precise in our description of behaviors of concern, whether they be academic, social, or physical. (p. 22)

PT has a rather extensive list of terms all aimed at the goal of facilitating communication. With respect to the standard acceleration chart, for example, terms such as "steep and shallow slopes" are referred to as acceleration or deceleration, and the chart is not referred to as logarithmic because, "Some people thought logarithms were dancing logs!" (Lindsley, 1971a, p. 7).

The fourth component of PT, the Behavior Bank (i.e., Koenig, 1971), was designed as a technology for facilitating dissemination. As Alper and White (1971) suggested:

A file with the DOES analysis (and the rate data to back them [the DOES analyses] up) will prove invaluable for the ultimate evaluation of an intervention; the planning of future interventions; explaining teaching techniques to administrators, teachers, and parents; and demonstrating or evaluating student progress. (p. 453)

Since the inception of the behavior bank it has ceased to be. As Wolking and Gerent (1984, p. 77) state, "It was an ingenious and ambitious project, years ahead of its time." They go on to suggest the demise of the bank was a function of it being "expensive, slow, and clumsy" (p. 77). Also, the Bank failed to provide easy answers to tough questions. Two important things learned from the Bank are: (a) Successful treatments are highly individual--there are no "universal rewards," and (b) data originally charted on add charts appear as straight lines on Standard Celeration charts (Personal communication, Kathy Porter, September, 1985). Data analysis for those involved in PT has shifted from sharing hundreds of charts to each person keeping their own chart.

The issue of dissemination has been addressed by PT practitioners in a unique way (cf. Lindsley, 1971b). As Lindsley has said, "PT is a tool used by teachers just as a shovel is a tool used by farmers. Farmers don't do research on their shovels, they dig with them!" (Lindsley, personal communication, 1984). Although many references regarding PT are published, the amount of unpublished manuscripts read at conferences or written as part

of degree requirements out-numbers the publications several times over. Also, the PT literature has a higher frequency of "personal communication" and unpublished manuscript citations than other technologies (e.g., Bower & Orgel, 1981). Lindsley (1971b, p. 57) explains this phenomenon as part of the PT philosophy that dictates " . . . if we are going to do anything about behaviorally managing the children of this country, it has got to be done with teachers and parents as agents. They are the ones who work directly with children."

For example, an article by a special education teacher, Evelyn Johnson (1971), describes how she successfully used PT after having learned the technology from Ann and Clay Starlin (e.g., A. Starlin, 1971; C. M. Starlin, 1971), who learned about PT at the University of Oregon (cf. C. M. Starlin, 1971), from Eric Houghton who had recently learned about PT from Ogden Lindsley at the University of Kansas (Houghton, 1971a).

Currently, those who prescribe to the Precision Teaching philosophy are a small but dedicated group who are very active in the branch of psychology called behavior analysis. In fact, at the time of this writing, Ogden Lindsley, the founder of Precision Teaching, is the President of the Association for Behavior Analysis. Precision Teaching researchers disseminate their work through the Journal of Precision Teaching, and announcements for the annual Precision Teaching conferences can be found therein.

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